ENSR Consulting
and Engineering
35 Nagog Park
Acton, Massachusetts 01720
(508) 635-9500
(508) 635-9180 (FAX)

February 1, 1991

ENSR Ref. No: 0186-002-170
ENSR Doc. No: ENS-8089

Mr. Roman Luzecky
Case Manager
Bureau of Federal Case Management
CN028
401 E. State Street
Trenton, NJ 08625-0028

RE: Supplemental Data - Discharge to Groundwater Application
UOP Site/Interim Remedial Measures

Dear Roman:

As discussed at our 11/27/90 meeting on the application to discharge the groundwater for the subject project, ENSR has collected supplementary data on the shallow groundwater and soil permeability rates at the Site. The testing and information to be gathered as defined in Section 6.1, draft DGW Permit Application was obtained on November 28, 1990 and December 5, 1990 while conducting a sewer investigation at the Site. Water table measurements were taken at most of the shallow and intermediate monitoring wells on site, and groundwater samples were collected from monitoring wells 11I, 13I and 23I in Area 2 and 27I in Area 1A. Refer to attached figure for site areas. These samples were analyzed for conventional wet chemistry parameters and calcium, magnesium and sodium. Four locations were selected in and around Area 5 (to the east of Area 1A) to field-determine percolation rates using an infiltrometer device. The following data were collected and arranged for submission as supplementary information to the draft DGW Permit Application package sent to NJDEP on 11/20/90.

A. Water Table Elevations

Measurements of groundwater in the existing on site shallow and intermediate monitoring well installations were taken on December 5, 1990. These water table measurements and corresponding elevations are listed on Table S-1.

These water table elevations were compared with previous water table measurements to examine similarities or differences in the shallow water table contours. The current elevations in Areas 1, 1A and 5 compare well with the measurements recorded on

December 2, 1986 (refer to Figure 4-2, DGW Application) except for water levels in the center of the site (i.e. MW 7I, 19I, 20I and 22I) which are higher by 0.5-0.8 ft and those monitoring wells (i.e. MW 10I and 28I) in Area 1A closest to Ackerman's Creek which are lower by 1.0-2.0 ft. It appears there is a low point in the water table near MW 28I which is influencing shallow groundwater movement into Area 1A from upgradient zones in Areas 1A and 5.

It was reported that a rainfall event occurred (1.6 inches of rain on December 3-4, 1990) prior to the measurements and is likely responsible for the higher elevations than reported before for the shallow water table beneath Areas 1, 1A and 5. However, it is difficult to assess due to the heterogeneity of the surficial soils and the drainage patterns created by underground pipes and channels.

The current elevations in Area 2 compare very well with the measurements recorded on November 4, 1986 (refer to Figure 4-1, DGW Application) especially in the mounded zone at the center of the Area.

B. Monitoring Well Data

Groundwater samples were collected from monitoring wells in Areas 1A (i.e. MW 27I) and 2 (i.e. MW 11I and duplicate, 13I and 23I) on December 5, 1990. The aqueous samples were analyzed for wet chemistry parameters (e.g. BOD, COD, pH, Ammonia, Nitrate, TSS, TDS and total phosphorous) and cations (i.e. calcium, magnesium and sodium). These data are presented on Table S-2.

The raw groundwater data indicate biochemical oxygen demand (BOD) and chemical oxygen demand (COD) levels, in the ranges of 16-131 mg/L and 95-456 mg/L, respectively. These concentrations are low for either a domestic or industrial wastewater and would not limit the land application of effluent. The total suspended solids (TSS) levels in the range of 36-788 mg/L are more typical of a domestic wastewater and would be partially removed by the on site treatment system and could effectively be removed (e.g. 99% removal) by spray irrigation on site.

The levels of ammonia (NH_4-N) and nitrate (NH_3-N) are in the ranges of 0.4-7.7 mg/L and <0.5-0.76 mg/L respectively, typical of a secondary effluent quality and could also be effectively removed to below water quality standards by spray irrigation. The levels of total dissolved solids (TDS), in a range of 384-2,610 mg/L, are considered high for either a domestic or industrial wastewater but are consistent with previous data. These levels are typical of water quality with a high chloride content (i.e. saline or brackish zones) near coastal areas. Also the total phosphorous levels, in a range of 0.2-4.2 mg/L, are typical of a domestic wastewater and would be effectively removed (e.g. 95-99% removal) by spray irrigation on site.

The cation (i.e. calcium, magnesium and sodium) concentrations were converted to milliequivalents/liter and calculated to determine the sodium adsorption rate (SAR) which is an indicator of whether the sodium content will cause the clay in the soil to swell and make the soil impermeable to air and water. A table S-2 footnote indicates the formula for computing SAR.

Based on the levels of sodium, calcium and magnesium reported for each monitoring well, the computed SAR for each groundwater sample is not at levels that could cause soil swelling if land application is performed.

C. Short-term Infiltrometer Tests

The short-term field infiltrometer tests were performed to provide an estimate of the short-term percolation rates of the Areas 1A and 5 shallow unsaturated soils. These estimates will provide a preliminary value for the hydraulic loading capacity of the soil.

These tests were conducted on November 28, 1990 at one location in Area 1A and three locations in Area 5. (Refer to Figure 2-2 for test locations) An infiltrometer setup was constructed from aluminum flashing at each test location. A permeameter was placed in the center of the infiltrometer set up and water added to the permeameter to maintain a constant head of 5 cm. When the permeameter began delivering water into the infiltrometer interior, the time and height of water in the permeameter was recorded every 1 or 2 minutes. Tables S-3 through S-5 are records of the infiltrometer tests at three locations including change in head versus time graph inserts. The test at location 4 was not recorded due to a rapid permeability condition.

Location 1, approximately 40' north and east of monitoring well 27I was conducted in Area 1A near the contaminated soils area. Hand-auguring nearby indicated a nearly saturated sandy loam soil over a substratum of loamy sand to sandy loam. An infiltration test was conducted for 110 minutes at this location where a relatively steady infiltration rate of 11.4 cm/min was recorded. Table S-3 presents the field data and a graph indicating the change in height of water in the permeameter with time. The gaps in data occurred during refilling of the permeameter. High infiltration rates at the beginning of some of the tests occurred because precise reestablishment of the 5 or 6 cm head of water was not possible, allowing some water to rapidly escape from the permeameter.

Location 2, approximately 20' east of monitoring well 18I, was conducted in Area 5 near the north boundary of the property. Soil augering was not possible beyond 6" due to the presence of subsurface gravel below 3" of coarse sand and gravelly/sandy loam. Crushed gravel covered approximately 80% of the surface. A relatively stable rate of 10 cm/min was recorded during 47 minutes of infiltration. Table S-4 presents the field data and a graph of height of water versus time for this location.

ENSR

Location 3, approximately 100' east of monitoring well 20I, was conducted in Area 5 near the center of the proposed spray irrigation area. The surface was covered with crushed gravel and pea stone. Augering was restricted to the top 6" again due to subsurface gravel below a nearly saturated layer of gravelly fine sandy loam. During 40 minutes of infiltration a relatively stable rate of 1.75 cm/min was recorded. Table S-5 summarizes the field data and graphically presents the change in head versus time for this location.

An attempt to perform an infiltrometer test near monitoring well 31I in the northeast corner of the site was unsuccessful because a head of water could not be maintained during the application of 15 gallons of water indicating rapid permeability in this area.

The short term infiltrometer testing performed on the site indicates that surficial materials will accept 1.75 to 11 cm/min of infiltrating water. These findings are consistent with the earlier successful land application of water during the lagoon remediation in the summer of 1990.

Additional field tests and lab analyses will be performed as defined in Section 6.2, draft DGW Permit Application, to aid in the design of a spray irrigation system on site.

ENSR is providing this information and data for NJDEP review as part of the subject DGW Permit Application. At your earliest convenience, please notify Mark Kamilow at Allied-Signal concerning the status of the DGW Permit Application especially with regard to initial acceptance for spray irrigation on site and to the schedule for submitting additional information as it becomes available.

Sincerely Yours,

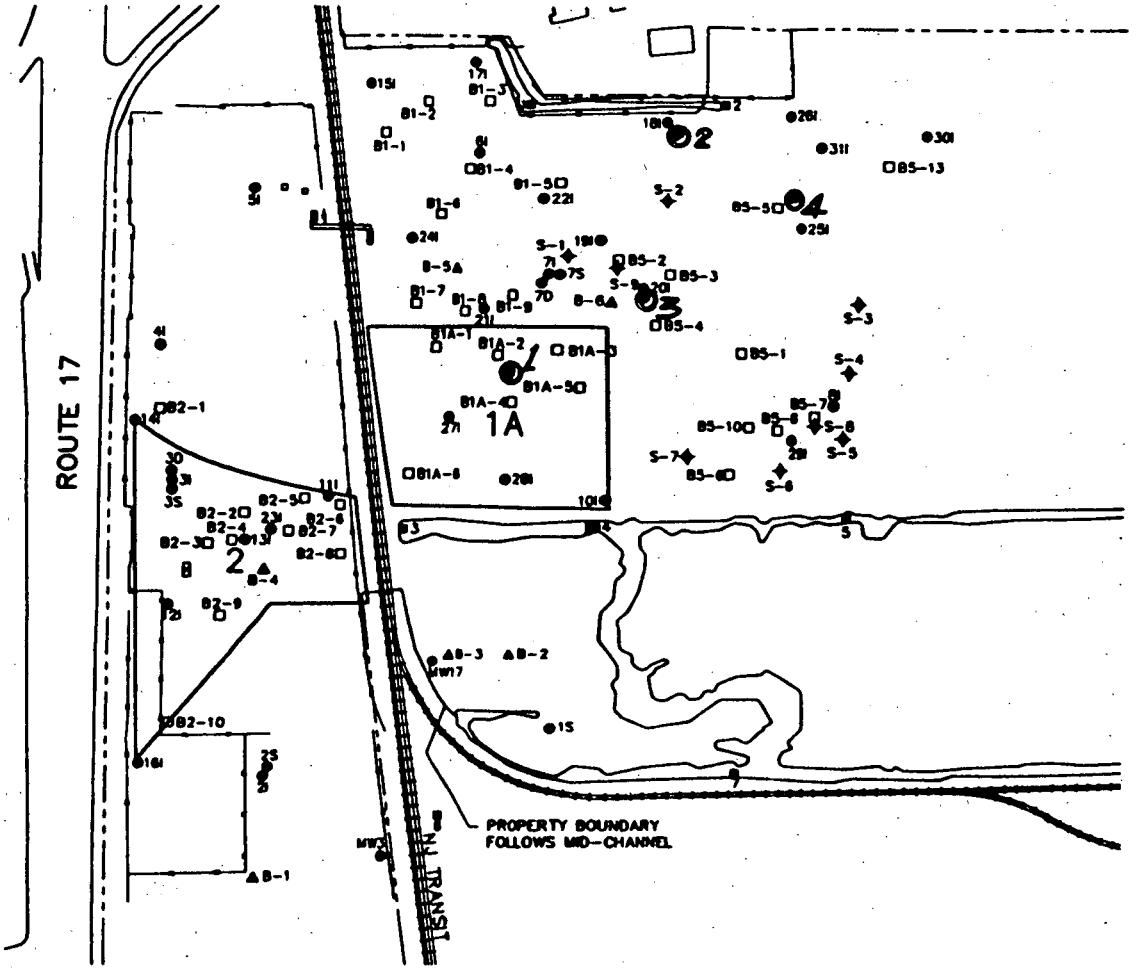
Steven A. Croce

Steven A. Croce, P.E.
Senior Project Manager

Michael C. Worthy /SAC

Michael C. Worthy, P.E.
UOP Site Project Manager

cc: Mark Kamilow
Linda Welkom



LEGEND

- MONITORING WELL LOCATION S,I-SHALLOW, D-DEEP
- STAFF GAUGE LOCATION
- SOIL BORING LOCATION
- SURFACE SAMPLE LOCATION
- INFILTROMETER TEST LOCATIONS

0 200 400

SCALE IN FEET

FIGURE 2-2

ENSR CONSULTING & ENGINEERING

MONITORING WELL AND SOIL BORING LOCATIONS
UOP SITE
EAST RUTHERFORD, N.J.

DRAWN BY	DATE	PROJECT NO.
J.E.B.	10/90	0186-002-170

Table S-1
UOP Site
Monitoring Well Water-Level Data
December 5, 1990

Date	Well #	Time	Elevation at Top of Casing* (ft above msl)	Depth to Water (ft)	Groundwater Elevation (ft above msl)
12/5/90	7I	10:00a	7.55	3	4.55
	7D	10:05a	7.97	2.74	5.23
	20I	10:11a	7.94	3.32	4.62
	10I (1)	10:16a	7.76	4.8	2.96
	28I	10:21a	7.68	6.1	1.58
	27I	10:24a	7.57	4.07	3.5
	21I	10:28a	8.35	4.26	4.09
	22I	10:40a	7.09	2.09	5
	19I	10:45a	8.09	2.93	5.16
	6I (1)	10:51a	7.54	2.7	4.84
	15I		5.58	Not Found	
	17I	10:57a	7.56	3.92	3.64
	18I	11:00a	6.59	2.69	3.9
	26I	11:02a	8.3	3.88	4.42
	30I	11:08a	9.46	4.96	4.5
	31I	11:12a	8.82	4.37	4.45
	25I	11:25a	6.95	2.39	4.56
	29I	11:41a	7.79	2.45	5.34
	11I	11:52a	6.6	3.75	2.85
	13I	11:59a	6.56	1.78	4.78
	23I	12:02p	6.28	1.84	4.44
	12I	12:06p	7.51	5.58	1.93
	3I			Could not get the cap off	
	4I	12:27p	7.58	4.92	2.66
	5I	12:37p	6.88	3.95	2.93
	2S	12:46p	6.78	3.53	3.25
	2I	12:48p	7.31	3.48	3.83
	16I			Knocked over	
	MW-3	12:55p	5.79	3.66	2.13

* Assumes that the Measuring Point Elevation referred to in Table A-III.1 was taken from the top of the inner casing.

(1) Field notes did not indicate monitoring well number. Assumptions were made based on the assumed path the technicians took as they sampled each well.

Table S-2
UOP Site
Monitoring Well Data

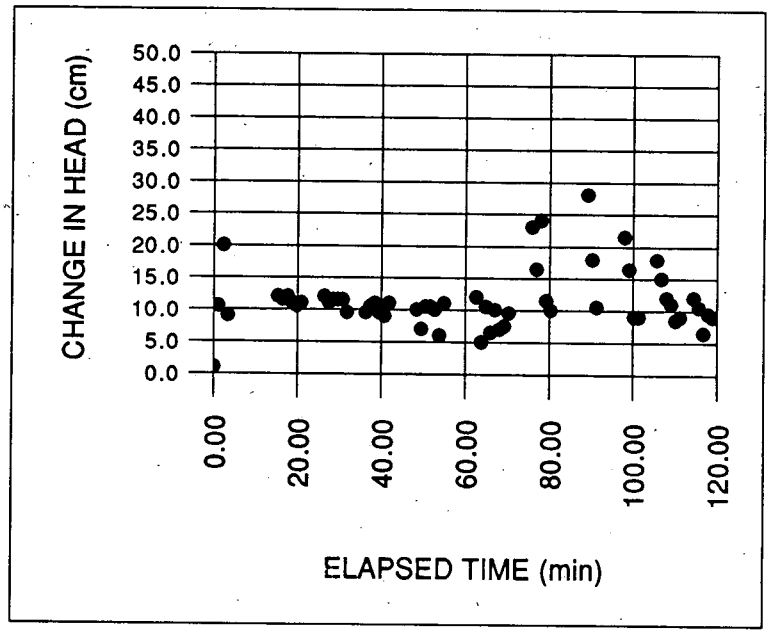
Parameter	AREA 2 *				AREA 1A *	
	MW-11I	MW-11J	MW-13	MW-23	MW-27I	Land App. Limits Slow Rate System
BOD	131	77	16	89	125	<1000
COD	456	270	255	95	387	
Ammonia	5.1	5.5	0.4	0.6	7.7	
Nitrate	0.76	0.75	<0.5	<0.5	<0.5	10
pH	6.67	6.75	7.03	6.45	6.59	
TSS	392	148	88	36	788	
TDS	2610	2460	1010	384	1830	
Total Phosphorous	1.6	1.1	0.4	0.2	4.2	
Calcium	82.8	83.6	103	40.6	194	
Magnesium	78.4	74.4	25.8	7.92	71.1	
Sodium	664	678	34.2	49.3	429	** SAR < 15

* All measurements in mg/l except pH.

** Sodium Adsorption Ratio (SAR) = $\dfrac{Na}{\sqrt{\dfrac{(Ca)+(Mg)}{2}}}$ in milliequivalents/liter.

TABLE S-3
INFILTROMETER TEST RESULTS
LOCATION 1

CHANGE IN TIME (min)	CHANGE IN HEAD (cm)
1	1.0
2	10.5
3	20.0
4	9.0
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	12.0
16	11.5
17	12.0
18	11.0
19	10.5
20	11.0
21	
22	
23	
24	
25	12.0
26	11.0
27	11.5
28	11.5
29	11.5
30	9.5
31	
32	
33	
34	9.5
35	10.5
36	11.0
37	9.5
38	9.0
39	11.0
40	
41	
42	
43	
44	
45	10.0
46	7.0



47	10.5
48	11
49	10
50	6
51	11
52	
53	
54	
55	
56	
57	
58	12
59	5
60	11
1	6.5
2	10.0
3	7.0
4	7.5
5	9.5
6	
7	
8	
9	
10	23.0
11	16.5
12	24.0
13	11.5
14	10.0
15	
16	
17	
18	
19	
20	
21	
22	28.0
23	18.0
24	10.5
25	
26	
27	
28	
29	
30	21.5
31	16.5
32	9.0
33	9.0
34	
35	
36	
37	18.0
38	15.0

39	12.0
40	11.0
41	8.5
42	9.0
43	
44	
45	12.0
46	10.5
47	6.5
48	9.5
49	9.0
50	9.0

Average cm/min	Std. Dev.
11.4	4.6

TABLE S-4
INFILTROMETER TEST RESULTS
LOCATION 2

CHANGE IN TIME (min)	CHANGE IN HEAD (cm)
1	8.0
2	13.5
3	12.5
4	9.0
5	8.5
6	12.5
7	9.0
8	
9	
10	
11	3.0
12	10.0
13	13.0
14	10.0
15	10.5
16	5.5
17	10.0
18	12.0
19	
20	
21	
22	5.0
23	9.5
24	11.5
25	12.0
26	12.0
27	9.0
28	6.0
29	
30	
31	
32	13.0
33	9.0
34	9.0
35	11.0
36	9.0
37	7.0
38	8.5
39	9.5
40	
41	
42	
43	12.0
44	13.0
45	10.0
46	13.0
47	11.0
Average (cm/min)	Std. Dev.
9.9	2.5

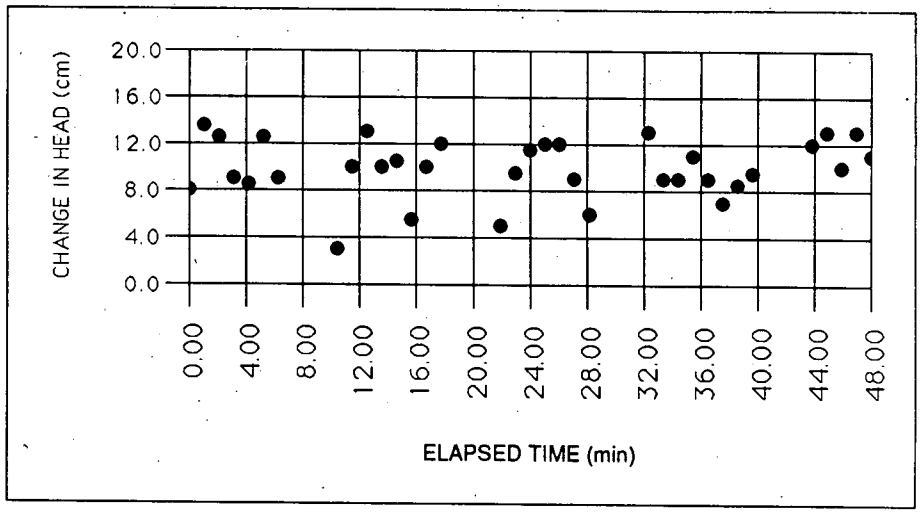


TABLE S-5
INFILTROMETER TEST RESULTS
LOCATION 3

CHANGE IN TIME (min)	CHANGE IN HEAD (cm)
2	10.0
4	4.0
6	4.0
8	1.0
10	4.0
12	3.0
14	2.0
16	1.5
18	6.5
20	2.0
22	2.0
24	4.5
26	4.0
28	3.5
30	2.5
32	3.0
34	3.5
36	2.5
38	0.5
40	7.0

Average (cm/ 2 min)	Std. Dev.
3.6	2.2